

What is claimed is:

1. A ferroelectric capacitor, comprising:

a lower electrode, a dielectric layer, and an upper electrode layer,

which are sequentially stacked,

wherein the dielectric layer has a multi-layer structure including a plurality of sequentially stacked ferroelectric films, and wherein two adjacent ferroelectric films have either different compositions or different composition ratios.

2. The ferroelectric capacitor as claimed in claim 1, wherein the ferroelectric capacitor further comprises:

an interlayer disposed in a position selected from the group consisting of between the lower electrode and the dielectric layer, between the upper electrode and the dielectric layer, and both between the lower electrode and the dielectric layer and the upper electrode and the dielectric layer.

3. The ferroelectric capacitor as claimed in claim 2, wherein the interlayer is a platinum (Pt) layer.

4. The ferroelectric capacitor as claimed in claim 1, wherein the dielectric layer is sequentially stacked first through third ferroelectric films.

5. The ferroelectric capacitor as claimed in claim 4, wherein the first through third ferroelectric films have a thickness of 3 nm - 50 nm, 30 nm - 150 nm, and 3 nm - 50 nm, respectively.

6. The ferroelectric capacitor as claimed in claim 2, wherein the dielectric layer is sequentially stacked first through third ferroelectric films.

7. The ferroelectric capacitor as claimed in claim 6, wherein the first through third ferroelectric films have a thickness of 3 nm - 50 nm, 30 nm - 150 nm, and 3 nm - 50 nm, respectively.

8. The ferroelectric capacitor as claimed in claim 4, wherein each of the first through third ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and

a BSO-PZT film, and wherein adjacent ferroelectric films are formed of a different material.

9. The ferroelectric capacitor as claimed in claim 6, wherein each of the first through third ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and a BSO-PZT film, and wherein adjacent ferroelectric films are formed of a different material.

10. The ferroelectric capacitor as claimed in claim 4, wherein each of the first through third ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and a BSO-PZT film, and wherein adjacent ferroelectric films are formed of the same material but have different composition ratios.

11. The ferroelectric capacitor as claimed in claim 6, wherein each of the first through third ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and

a BSO-PZT film, and wherein adjacent ferroelectric films are formed of the same material but have different composition ratios.

12. The ferroelectric capacitor as claimed in claim 1, wherein the dielectric layer is sequentially stacked first and second ferroelectric films.

13. The ferroelectric capacitor as claimed in claim 12, wherein the first and second ferroelectric films have a thickness of 3 nm - 50 nm and 30 nm - 150 nm, respectively.

14. The ferroelectric capacitor as claimed in claim 2, wherein the dielectric layer is sequentially stacked first and second ferroelectric films.

15. The ferroelectric capacitor as claimed in claim 14, wherein the first and second ferroelectric films have a thickness of 3 nm - 50 nm and 30 nm - 150 nm, respectively.

16. The ferroelectric capacitor as claimed in claim 12, wherein each of the first and second ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and a BSO-PZT film, and wherein the first and second ferroelectric films are formed of a different material.

17. The ferroelectric capacitor as claimed in claim 14, wherein each of the first and second ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and a BSO-PZT film, and wherein the first and second ferroelectric films are formed of a different material.

18. The ferroelectric capacitor as claimed in claim 12, wherein each of the first and second ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and a BSO-PZT film, and wherein the first and second ferroelectric films are formed of the same material but have different composition ratios.

19. The ferroelectric capacitor as claimed in claim 14, wherein each of the first and second ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT ($\text{Pb}_{1-z}\text{La}_z\text{Zr}_x\text{Ti}_{1-x}\text{O}_3$) film, and a BSO-PZT film, and wherein the first and second ferroelectric films are formed of the same material but have different composition ratios.

20. The ferroelectric capacitor as claimed in claim 1, wherein the upper electrode and the lower electrode are formed of a single layer of either a metal or a conductive oxide.

21. The ferroelectric capacitor as claimed in claim 20, wherein the metal is platinum (Pt) or iridium (Ir).

22. The ferroelectric capacitor as claimed in claim 20, wherein the conductive oxide is iridium oxide (IrO_2) or ruthenium oxide (RuO_2).

23. The ferroelectric capacitor as claimed in claim 1, wherein the upper and lower electrodes are formed of a sequentially stacked metal layer and a conductive oxide layer.

24. The ferroelectric capacitor as claimed in claim 23, wherein the metal is platinum (Pt) or iridium (Ir).

25. The ferroelectric capacitor as claimed in claim 23, wherein the conductive oxide is iridium oxide (IrO_2) or ruthenium oxide (RuO_2).

26. A method for manufacturing a ferroelectric capacitor in which a lower electrode, a dielectric layer, and an upper electrode layer are sequentially stacked, comprising:

forming a first ferroelectric film on the lower electrode; and

forming a second ferroelectric film on the first ferroelectric film, wherein the second ferroelectric film has a different composition or a different composition ratio from the composition or composition ratio of the first ferroelectric film, to form the dielectric layer.

27. The method as claimed in claim 26, wherein the first ferroelectric film is formed to a thickness of 3 nm - 50 nm and the second ferroelectric film is formed to a thickness of 30 nm - 150 nm.

28. The method as claimed in claim 26, further comprising:
forming a third ferroelectric film on the second ferroelectric film,
wherein the third ferroelectric film has a different composition or a different composition ratio from the composition or composition ratio of the second ferroelectric film.

29. The method as claimed in claim 28, wherein the third ferroelectric film is formed to a thickness of 3 nm - 50 nm.

30. The method as claimed in claim 26, wherein each of the ferroelectric films is formed at a temperature of 300 - 450 °C.

31. The method as claimed in claim 28, further comprising:
annealing at a temperature that is higher than the temperature for the formations of the first through third ferroelectric films after forming the ferroelectric films.

32. The method as claimed in claim 31, wherein the annealing temperature is 450 - 650 °C.

33. The method as claimed in claim 26, wherein the first and the second ferroelectric films are formed using different formation processes to have the same composition but different composition ratios.

34. The method as claimed in claim 26, wherein the first and the second ferroelectric films are formed using the same formation process to have different compositions.

35. The method as claimed in claim 33, wherein the first and the second ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT film, and a BSO-PZT film.

36. The method as claimed in claim 34, wherein the first and the second ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT film, and a BSO-PZT film.

37. The method as claimed in claim 35, wherein the first and the second ferroelectric films are formed using either a chemical solution deposition (CSD), a metal organic chemical vapor deposition (MOCVD), or a combination of the two deposition processes.

38. The method as claimed in claim 36, wherein the first and the second ferroelectric films are formed using either a chemical solution deposition (CSD), a metal organic chemical vapor deposition (MOCVD), or a combination of the two deposition processes.

39. The method as claimed in claim 28, wherein the second and the third ferroelectric films are formed using different formation processes to have the same composition but different composition ratios.

40. The method as claimed in claim 28, wherein the second and the third ferroelectric films are formed using the same formation process to have different compositions.

41. The method as claimed in claim 28, wherein the first and the second ferroelectric films are formed using different formation processes to have the same composition but different composition ratios, and

wherein the second and the third ferroelectric films are formed using the same formation process to have different compositions.

42. The method as claimed in claim 39, wherein the second and the third ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT film, and a BSO-PZT film.

43. The method as claimed in claim 40, wherein the second and the third ferroelectric films are formed of a material selected from the group consisting of a PZT film, a PLZT film, and a BSO-PZT film.

44. The method as claimed in claim 42, wherein the second and the third ferroelectric films are formed using either a chemical solution deposition (CSD), a metal organic chemical vapor deposition (MOCVD), or a combination of the two deposition processes.

45. The method as claimed in claim 43, wherein the second and the third ferroelectric films are formed using either a chemical solution deposition (CSD), a metal organic chemical vapor deposition (MOCVD), or a combination of the two deposition processes.

46. The method as claimed in claim 26, further comprising:
forming an interlayer between the lower electrode and the dielectric layer to facilitate the formation of the first ferroelectric film.

47. The method as claimed in claim 28, further comprising:

forming an interlayer between the upper electrode and the dielectric layer to facilitate the formation of the third ferroelectric film.